4/13/18

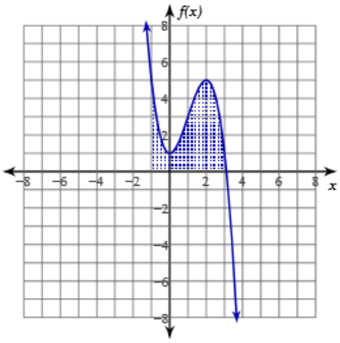
"In order to understand the value in a shortcut, one must have taken the long road first."
-Anonymous

HW: Enjoy the weekend!

AIM: How do we determine the area under the curve?

Warm Up:

1) $\int_{-1}^{3} (-x^3 + 3x^2 + 1)\, dx$



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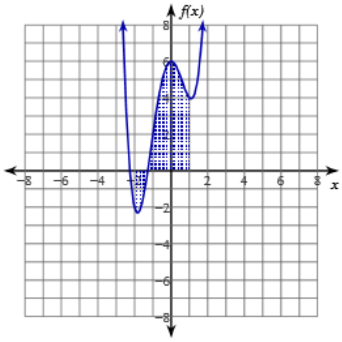
2) $\int_{-2}^{1} (x^4 + x^3 - 4x^2 + 6)\, dx$



$\frac{177}{20} = 8.85$

3) $\int_{1}^{3} (2x^2 - 12x + 13)\, dx$

$-\frac{14}{3} \approx -4.667$

4) $\int_{0}^{3} (-x^3 + 3x^2 - 2)\, dx$

$\frac{3}{4} = 0.75$

5) $\int_{-1}^{0} (x^5 - 4x^3 + 4x + 4)\, dx$

$\frac{17}{6} \approx 2.833$

6) $\int_{-3}^{0} 4x^{\frac{1}{3}}\, dx$

$-9\sqrt[3]{3} \approx -12.98$

7) $\int_{-4}^{-1} -\frac{4}{x^3}\, dx$

$\frac{15}{8} = 1.875$

8) $\int_{-3}^{-1} \frac{4}{x}\, dx$

$-4\ln 3 \approx -4.394$

9) $\int_{-\frac{\pi}{4}}^{-\frac{\pi}{6}} 2\cos x\, dx$

$-1 + \sqrt{2} \approx 0.414$

10) $\int_{\sqrt{2}}^{2} \frac{1}{x\sqrt{x^2 - 1}}\, dx$

$\frac{\pi}{12} \approx 0.262$

11) $\int_{-3}^{-2} 5(2x + 4)^{\frac{1}{3}}\, dx$

$-\frac{15\sqrt[3]{2}}{4} \approx -4.725$

12) $\int_{-1}^{2} \frac{2}{(2x + 4)^3}\, dx$

$\frac{15}{128} \approx 0.117$

13) $\int_{-1}^{1} e^{2x - 2}\, dx$

$\frac{e^4 - 1}{2e^4} \approx 0.491$

14) $\int_{-4}^{-2} (-x + |-3x - 9|)\, dx$

9

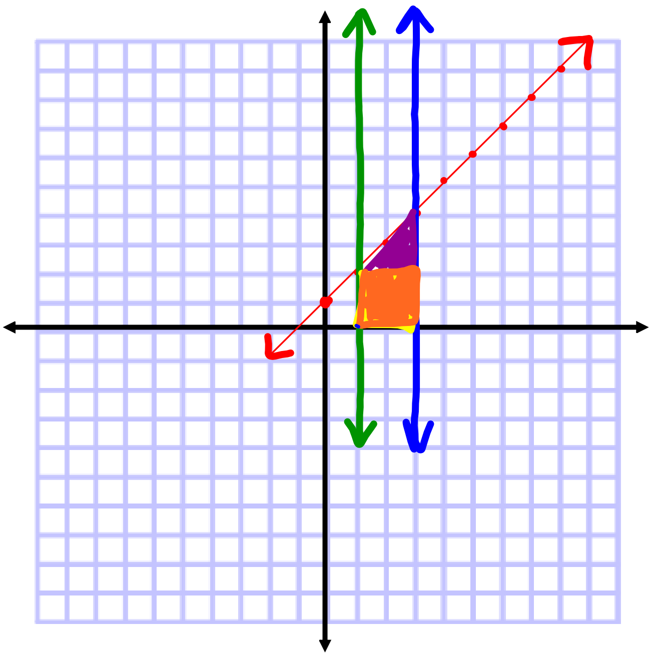
15) $\int_{0}^{3} f(x)\, dx,\ f(x) = \begin{cases} \frac{x}{2} - 1, & x \le 2 \\ x^2 - 6x + 8, & x > 2 \end{cases}$

$-\frac{5}{3} \approx -1.667$

16) $\int_{-5}^{1} -|x^2 + 4x|\, dx$

$-\frac{46}{3} \approx -15.333$

1) Graph y = x + 1, x = 1, x = 3. What is the area under the graph and above the x-axis?



$A\,\Delta = \frac{1}{2}(2)(2) = 2$

$A\,\square = 2 \cdot 2 = \underline{+\,4}$

6

$\boxed{\text{Area} = 6\text{units}^2}$

2) Evaluate:

$$\int_1^3 (x+1)dx$$

$$= \left.\frac{x^2}{2} + x + c\right]_1^3$$

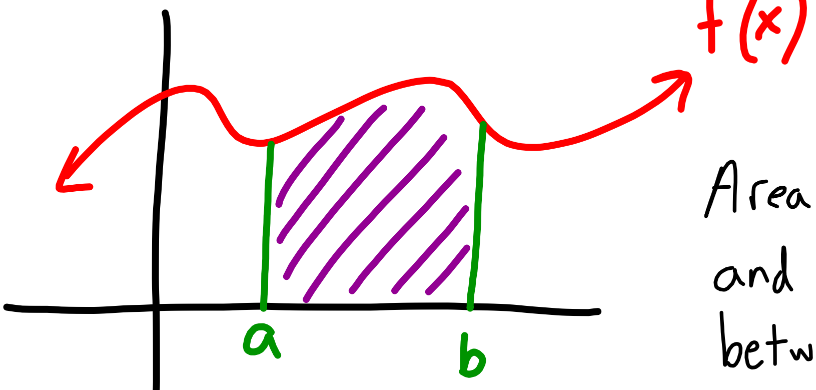
$$= \left(\frac{3^2}{2} + 3\right) - \left(\frac{1^2}{2} + 1\right)$$

$$= \left(\frac{9}{2} + 3\right) - \left(\frac{1}{2} + 1\right)$$

$$= (7.5) - (1.5)$$

$$= \boxed{6}$$

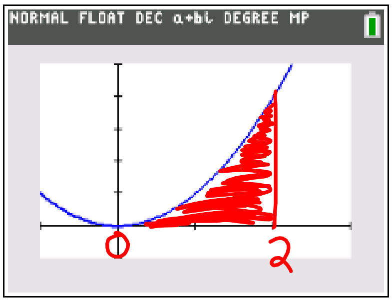
Summary:



Area between f(x) and the x-axis between [a, b] is:

$$\boxed{\text{Area} = \int_a^b f(x)\,dx}$$

3) What is the area between $f(x) = x^2$ and the x-axis on the interval [0,2]?

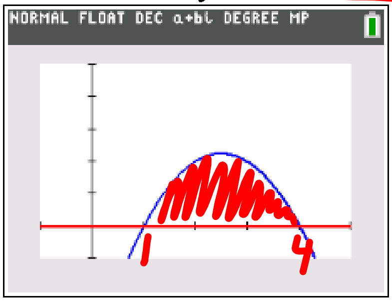


$$\text{Area} = \int_0^2 (x^2)\,dx$$

$$\text{Area} = \left.\frac{x^3}{3} + c\,\right]_0^2$$

$$\text{Area} = \left(\frac{2^3}{3}\right) - \left(\frac{0^3}{3}\right) = \boxed{\frac{8}{3} \text{ units}^2}$$

4) What is the area in the 1st quadrant between $y = -x^2 + 5x - 4$ and the x-axis?



$0 = -x^2 + 5x - 4$

$x^2 - 5x + 4 = 0$

$(x-4)(x-1) =$

$x = 4 \quad x = 1$

$$\text{Area} = \int_1^4 (-x^2 + 5x - 4)\,dx$$

$$\text{Area} = -\frac{x^3}{3} + \frac{5x^2}{2} - 4x + c \Big]_1^4$$

$$\text{Area} = \left(\frac{-4^3}{3} + \frac{5(4)^2}{2} - 4(4)\right) - \left(\frac{-1^3}{3} + \frac{5(1)^2}{2} - 4(1)\right)$$

$$= \left(\frac{-64}{3} + \frac{80}{2} - 16\right) - \left(\frac{-1}{3} + \frac{5}{2} - 4\right)$$

$$\text{Area} = \boxed{4.5 \text{ units}^2}$$